CEE trade in services: value added versus gross terms approaches

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Abstract

The main objective of this paper is to assess the impact of selected determinants on exports in both value added terms and in gross terms for seven CEE economies, based on seven service subsectors and using data for the years 1995-2011. The results of the estimations confirm the importance of increasing labour productivity and highly-skilled and medium-skilled workers for growth in trade in services. Exports of services are also supported by strong linkages between domestic services, especially financial and business services, and the manufacturing sector. The results of the analysis show the impacts of the main determinants are fairly similar when exports are measured in value added terms or in gross terms, however the strength of impact differs in Baltic countries and Visegrad countries, especially for labour productivity.

JEL classification codes: **C23, D54, F14, L80**
Keywords: **gross exports, value added exports, CEE economies, trade in services**

Introduction

Global value chains (GVCs) have been rapidly evolving over the last decade. They come in different shapes and sizes and it may be neither possible nor desirable to create a one-size-fits-all policy to support the position and participation of countries in them. Government policy decisions require new data – new indicators to estimate and evaluate the position of countries in the new global economy. A possible solution could be analysis of trade in value added (VA), which takes into account the added value embodied in intermediate flows, in contrast with gross

trade statistics, where this flow is overlooked and so may possibly lead to biased estimations (Foster-McGregor and Stehrer 2013; Stehrer 2013). EU countries are encountering competition in GVCs from emerging economies such as China, Brazil and India, and increasingly for high-value products. For this reason, the European Commission has "refocused attention on the central importance of a strong, competitive and diversified industrial manufacturing value chain for the EU's competitiveness and job creation potential" (COM 2010). The importance of global value chains measured as a percentage of a country's total exports is even greater for CEE countries than for other developed EU countries (i.e. 62.4% for the Czech Republic, 56.6% for Hungary, 50.2% for Lithuania, 49.5% for Germany, 45.9% for France)[1] and exporters from CEE countries are usually located further 'downstream' – i.e. closer to the customer buying the finished product – than their euro area partners.

In spite of the fact that the European Commission is paying attention to the competitiveness of the manufacturing sector, the growing role of services in manufacturing goods makes it worth examining the service sector closely. The problem is how the importance of services in an economy should be measured, in gross terms or in value-added terms. Differences between these measures of trade in services can be seen in the results of studies which focus on the distribution of revealed comparative advantages (RCA) as a measure of competitiveness, e.g. RCA indices for German business services are significantly higher in value-added terms than in gross export terms, leading to the conclusion that the German business services sector has comparative advantages rather than disadvantages (Deb and Hauk 2015). Similar calculations for business services in India indicate that RCAs based on added value are lower than indices based on gross exports (Wang et al. 2013). This leads to a new more important and still open question regarding the factors that determine a growth in trade in services measured in terms of added value.

So far, few analyses related to the determinants of trade in services have been conducted and they are mainly based on gross trade data. They mostly use gravity models, which often only show the impact of a few determinants on exports: market size, geographical location, language and gaps between economies in terms of resources and technology (Dao et al. 2015; Grunfeld and Moxnes 2013; Guardia et al. 2005; Kimura and Lee 2008; Walsh 2008). Kimura and Lee's (2008) results imply that a gravity model performs better for trade in services than for trade in goods and that geographical distance has a greater influence on services than on goods. Many studies confirm the significant role of GDP for both importing and exporting countries (Dao et al. 2015), the FDI flow (Grunfeld and Moxnes 2013) and a common language (Walsh 2008) in

[1]https://www.ecb.europa.eu/home/pdf/research/compnet/20131212/ws_3_iossifov.pdf?12244fa23bc7a0682cd1ec77c52f6659

explaining trade in services. Additionally, according to Wörz's (2008) analysis of the Austrian economy, a highly-skilled workforce and high levels of labour productivity also have a positive effect on the competitiveness of the service sector. Marel (2011), in turn, indicates the quality of country governance as an important determinant of comparative advantage in conventional trade in services.

The main weakness of all the above-mentioned analyses is their use of service trade data in gross terms. The approach proposed by Landesmann et al. (2015) partly eliminates this gap. Their study is an econometric analysis of the determinants of exports for 35 industries and 40 countries over the period 1995-2007 in both gross and VA terms and for both manufacturing and services. Their model includes explanatory variables highlighted by traditional and new trade theories, i.e. labour productivity, skill composition, the vertical cross-border production integration ratio and domestic and foreign business service linkages, among others. However, a weakness of their analysis is a high heterogeneity of the economies grouped in the same sample. In the present study we only focus on CEE countries, which form quite a homogenous group of economies in terms of their GDP per capita, the large shares of manufacturing goods in their total exports and the importance of the EU market as their main export destination. We also analyse the character of the linkages between the manufacturing sector and the chosen service sectors in more detail.

The aim of this study is thus to fill the gap in the empirical literature by finding the determinants of the export flows of services measured in both value added and gross terms for seven selected CEE economies – the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland and Slovakia – using data on seven tradable service sectors (NACE 1.1) for the years 1995-2011.

The structure of the paper is as follows. In the first section, the significance of services in trade, in global value chains and in manufacturing is discussed. This is followed by a presentation of the data used in the analysis and the methodology employed. In the subsequent section, we present the results of our empirical analysis of the importance of the chosen determinants in trade in services in the selected CEE countries in the period 1995-2011. The final section concludes.

The role of services in trade, global value chains and manufacturing

Services now represent the largest share in domestic economies, especially in advanced countries, and account for almost 70% of global GDP and more than 55% of global employment (World

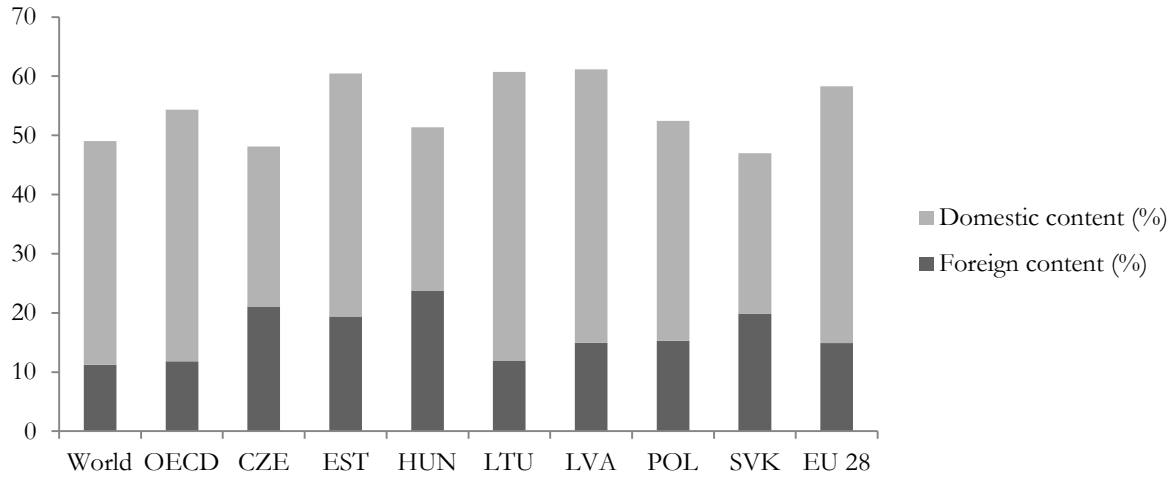
Bank 2016). An increasing role of services can also be observed in international trade. There are two main reasons for this phenomenon. First, the tradability of services has very strongly risen over the last decade, i.e. there has been a large increase in the range of services that can be digitized and traded globally, such as processing insurance claims, call centres, desktop publishing, compiling audits, completing tax returns, transcribing medical records and online education (Ghani et al. 2012). For this reason, trade in newer types of services, particularly those that can be conducted via the internet, has been growing rapidly in recent years (OECD, 2016). Second, deregulation in the service sector and liberalization in service trade connected with the multilateral rules on service trade established in the Uruguay Round negotiations have made a large contribution to the growth in service trade. The result of all this is that during the last decade (2005-2015) commercial service trade has grown 2 percentage points faster that merchandise trade on average.[2] Two factors – human capital and information technologies – are crucial to explain the dynamic growth in the export of modern services, especially in developing countries (Goswami et al. 2011).

Evidence can also be found at the micro level to confirm a special role of services in trade intensity. According to Lodefalk (2013), the probability of exporting is associated with the availability and quality of services. Additionally, this availability of services is associated with the share of firms that export (Lodefalk, 2014).

However if we analyse statistics on international transactions drawn from balance of payments (BOP) figures, which reflect transactions between residents and non-residents, the share of services in word trade would seem to have been quite stable over the last two decades and only to have oscillated around 20% (Lanz and Maurer 2015). In contrast, when the role of services in trade is assessed using the share of services in the added value of gross exports, service exports become much more important. The content of services in gross exports is around 50% of world cross-border trade, but for five of the seven CEE countries analysed here this share becomes even larger (Figure 1). This discrepancy between the 'BOP approach' and the 'value added approach' to measuring service trade can be explained by the new role of services in word trade as intermediate services, i.e. they are not only directly exported but first of all they are traded indirectly as part of the export of goods.

[2] Commercial service exports are defined as total services excluding government service; own calculation based on the WTO database time series on international trade.

Figure 1 The percentage of the value added content of services in gross exports in 2011.



Source: own calculation, OECD-WTO TiVA Database

Note. The domestic (foreign) share of the added value of services in gross exports is the share of the domestic (foreign) value added by service industries in the total gross exports by industry i in country c. For this measure, the service industries include ISIC Rev. 3 (NACE Rev. 1) divisions 45 to 95.

The dynamic growth of intermediate services in trade is connected with the rapid growth of GVCs, which are characterized by a large fragmentation of production, specialization in tasks/actives and the outsourcing of activities. In GVCs, services provide the 'link' or the 'glue' at each point in the chain without which it could not happen, e.g. transport, telecommunications, logistics, distribution, marketing, design, R&D etc. UCTAD (2013) finds evidence that the quality and cost of services determine country participation in GVCs. How services are linked into the worldwide value chain can be shown in the case of car production in the US, where service inputs are supplied all along the value chain and they represent close to thirty percent of the value of the finished car (WEF, 2012).[3] The size of the demand for services in GVCs is shown in another case study. The Swedish machine tool firm Sandvik Tooling uses over 40 different types of services in the various stages of production, and in addition Sandvik also supplies about 15 different types of service itself. (OECD, WTO and World Bank 2014).[4] On the macro scale, more than 70 percent of world service imports today are intermediate services used in production organized in GVCs (OECD 2012).

[3] The activities and components that go into the production of a typical American car are the following (services in bold): 1. **R&D for advanced technology** (Japan – 17.5%) 2. **Design** (3% (estimate)) 3. **Assembly** (Korea – 30%) 4. **Assembly** (US – 37%) 5. **Supply of minor parts** (Taiwan – 4%) 6. **Advertising and marketing** (UK – 2.5%) 7. **Data processing** (Ireland and Barbados – 2%) 8. **Transport and insurance** (4% (estimate))(WEF 2012).

[4] In another case study, only 9% of the value of a 450US$ man's suit jacket made in China and exported to the United States can be traced to direct manufacturing costs. The other 91% consists of various services, intellectual property, profits, and other 'invisibles' that are difficult to quantify (OECD et al., 2014).

Services play an exceptional role in the manufacturing sector. OECD (2014) finds a strong positive correlation between business service productivity and labour productivity in manufacturing. There are three key drivers which encourage manufacturers to incorporate more services at all stages in product value chains (USITC 2013): first, an increasing geographical dispersion of supply chains with specialization, which causes a movement of low-skill production work to low-wage locations; second, a need to cut costs and improve efficiency, which forces firms to use a variety of new technologies (often ICT services); and third, opportunities for premium pricing or improved market positions by providing services (often business services) to better differentiate and customize products.

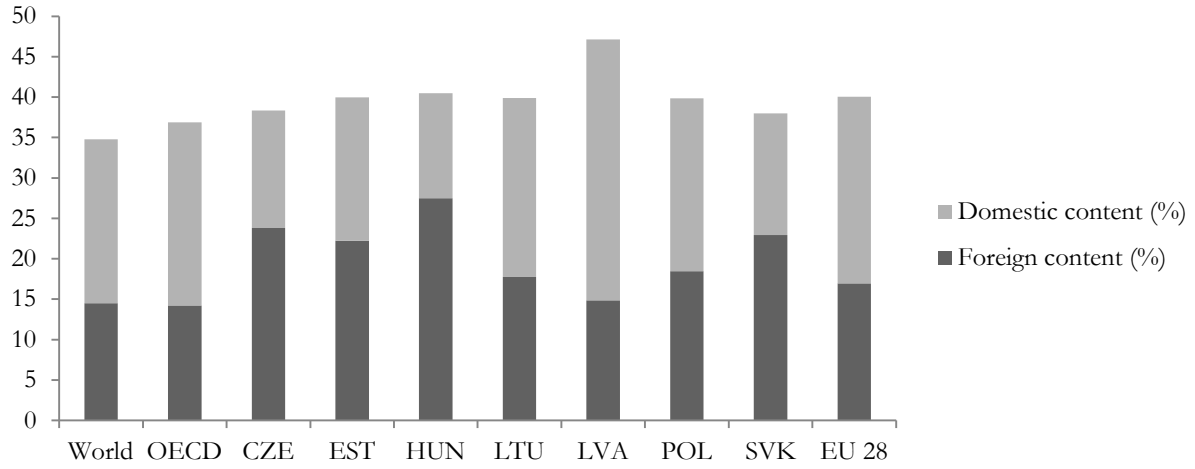
The increasing role of services in manufacturing is often described in the literature as the 'servicification' of manufacturing,[5] i.e. the idea that value added by the service sector is becoming more important in manufacturing (Baldwin et al. 2015). The great intensity of servicification is an effect of modern manufacturing production processes, which take the shape of a 'smile' curve and are characterized by three major stages: pre-fabrication services (high value added), fabrication (low value-added, with activities offshored to emerging and developing economies) and post-fabrication services (high value added).[6] This means that the content of service added value in manufacturing trade is high, and also in CEE manufacturing exports, where service added value accounts for almost 40% of the gross exports of manufacturing industries (Figure 2).

Even though domestic sourcing of services accounts for most of the servicification in world manufacturing, international sourcing of services, as captured by the foreign service added value content of exports, is significant in some CEE countries like the Czech Republic, Hungary, Estonia and Slovakia. Among these services, business services play an extremely important role. They are an integral part of global value chains, and are often outsourced and/or offshored by companies in GVCs. Among business services, two sectors – financial intermediation (sector J) and business services (subsectors 71-74) – have the highest shares in the total trade in services in 2011, unlike 10 years ago (OECD 2012).

[5] 'Servicification' of manufacturing is a synonym of the terms 'servicizing' and 'manuservice' (Low, 2013).

[6] Some argue that there has been a tendency in OECD countries for the smile curve to deepen, moving from relatively flat – meaning value evenly spread all along the chain – to U-shaped – with fabrication and assembly accounting for a much lower share of value (OECD 2013).

Figure 2 Percentage service added value content in manufacturing exports in 2011.



Source: own calculation on the OECD-WTO TiVA database

Note. The domestic (foreign) share of the added value of services in gross exports is the share of the domestic (foreign) value added by service industries in the total gross exports by industry i in country c. For this measure, the service industries include ISIC Rev. 3 (NACE Rev. 1) divisions 45 to 95.

In sum, the service sector is more and more making a significant contribution to export growth in all countries, and at the same time represents a large opportunity to find new comparative advantages in trade.

Data description and methodology

Our investigation uses an unbalanced panel which is built on the basis of country-sector annual data for seven selected CEE countries – the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland and Slovakia – and for seven service sub-sectors treated as tradable. The analysis covers the period 1995-2011. The tradable service sector which is taken into consideration in NACE 1.1 consists of transport services – inland transport (60), water transport (61), air transport (62), other transport services (63), post and telecommunication services (64), financial intermediation services (J) and business services (71t74), which comprise rental services for machinery and equipment, computer and related services, and research and development. The main source of data used in this analysis is the World Input Output Database (Timmer et al. 2015), which is the most comprehensive database for sectoral analysis.[7]

In order to evaluate trade and its determinants in this specific group of services we take two concepts into consideration. The first approach is based on total gross exports and the second uses domestic value added exports.

[7] It is expected that a new revision of WIOD will appear in November 2016.

The decomposition of gross export flows is based on methodology proposed by Wang et al. (2013) (henceforth WWZ).[8] WWZ's approach provides detailed information about 16 components of exports, in particular about the domestic value added exports which is absorbed abroad (DVA). In the general case of G countries and N sectors, the inter-country input-output model is as follows:

$$\begin{bmatrix} X^1 \\ X^2 \\ \vdots \\ X^G \end{bmatrix} = \begin{bmatrix} A^{11} & A^{12} & \cdots & A^{1G} \\ A^{21} & A^{22} & \cdots & A^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ A^{G1} & A^{G2} & \cdots & A^{GG} \end{bmatrix} \begin{bmatrix} X^1 \\ X^2 \\ \vdots \\ X^G \end{bmatrix} + \begin{bmatrix} Y^{11} & Y^{12} & \cdots & Y^{1G} \\ Y^{21} & Y^{22} & \cdots & Y^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ Y^{G1} & Y^{G2} & \cdots & Y^{GG} \end{bmatrix}, \tag{1}$$

and can be re-written as a gross output decomposition matrix of the following form:

$$\begin{bmatrix} X^{11} & X^{12} & \cdots & X^{1G} \\ X^{21} & X^{22} & \cdots & X^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ X^{G1} & X^{G2} & \cdots & X^{GG} \end{bmatrix} = \begin{bmatrix} B^{11} & B^{12} & \cdots & B^{1G} \\ B^{21} & B^{22} & \cdots & B^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B^{G1} & B^{G2} & \cdots & B^{GG} \end{bmatrix} \begin{bmatrix} Y^{11} & Y^{12} & \cdots & Y^{1G} \\ Y^{21} & Y^{22} & \cdots & Y^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ Y^{G1} & Y^{G2} & \cdots & Y^{GG} \end{bmatrix}, \tag{2}$$

where A and B are GN×GN matrices, A^{sr} is an N×N block matrix of input-output coefficients, B^{sr} is an N×N block global Leontief inverse matrix, X^{sr} is a N×1 vector of gross output and Y^{sr} is an N×1 vector for global use. Both Y in equation (1) and X in equation (2) are GN×G matrices.

In the general case, the total value added multiplier is specified as:

$$VB = \begin{bmatrix} V^1 & 0 & \cdots & 0 \\ 0 & V^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & V^G \end{bmatrix} \begin{bmatrix} B^{11} & B^{12} & \cdots & B^{1G} \\ B^{21} & B^{22} & \cdots & B^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B^{G1} & B^{G2} & \cdots & B^{GG} \end{bmatrix} = \begin{bmatrix} V^1B^{11} & V^1B^{12} & \cdots & V^1B^{1G} \\ V^2B^{21} & V^2B^{22} & \cdots & V^2B^{2G} \\ \vdots & \vdots & \ddots & \vdots \\ V^{G1}B^{G1} & V^GB^{G2} & \cdots & V^GB^{GG} \end{bmatrix}, \tag{3}$$

where V^s is a 1×N vector of the direct value added coefficients of country s and VB is a GN×G matrix.

For two trading countries, s and r, the total gross export flows are described by:

$$E^{sr} = A^{sr}X^r + Y^{sr}. \tag{4}$$

Both the intermediate and final goods exported by country s to country r can be considered and decomposed separately. By decomposing gross output on the basis of (2) and inserting the result into the first element of the right-hand side of equation (4) we obtain

$$\begin{aligned} A^{sr}X^r = {} & A^{sr}B^{rr}Y^{rr} + A^{sr}\sum\nolimits_{t\neq s,r}^{G} B^{rt}Y^{tt} + A^{sr}B^{rr}\sum\nolimits_{t\neq s,r}^{G} Y^{rt} + A^{sr}\sum\nolimits_{t\neq s,r}^{G} B^{rt}\sum\nolimits_{u\neq s,t}^{G} Y^{tu} \\ & + A^{sr}B^{rr}Y^{rs} + A^{sr}\sum\nolimits_{t\neq s,r}^{G} B^{rt}Y^{ts} + A^{sr}B^{rs}Y^{ss} + A^{sr}\sum\nolimits_{t\neq s,r}^{G} B^{rs}Y^{st} \end{aligned}. \tag{5}$$

According to where the intermediate good exports are used we can distinguish

$$A^{sr}X^r = A^{sr}L^{rr}Y^{rr} + A^{sr}L^{rr}E^{r*}, \tag{6}$$

[8] We use the *decompr* R package provided by Quast and Kummnitz (2015).

where L is an N×N local Leontief inverse matrix and E^{r*} is an N×1 vector of total gross exports by country *r*.

Equation (3) allows the total value added multipliers for individual countries to be obtained. Taking them into consideration, intermediate good exports are expressed as:

$$\begin{aligned} A^{sr}X^{r} &= (V^{s}L^{ss})^{T}\#(A^{sr}X^{r}) + (V^{s}B^{ss} - V^{s}L^{ss})^{T}\#(A^{sr}X^{r}) \\ &+ (V^{r}L^{rs})^{T}\#(A^{sr}X^{r}) + (\sum_{t\neq s,r}^{G} V^{t}B^{ts})^{T}\#(A^{sr}X^{r}) \end{aligned} . \quad (7)$$

Inserting (5) and (6) into equation (7) and defining final good exports as

$$Y^{sr} = (V^{s}B^{ss})^{T}\#Y^{sr} + (V^{r}B^{rs})^{T}\#Y^{sr} + (\sum_{t\neq s,r}^{G} V^{t}B^{ts})^{T}\#Y^{sr}, \quad (8)$$

we obtain WWZ's model of the decomposition of the total exports for G-country and N-industry, which is expressed in the following way:[9]

$$\begin{aligned} E^{s*} &= \underbrace{(V^{s}B^{ss})^{T}\#\sum_{r\neq s}^{G} Y^{sr}}_{DVA\_FIN} + \underbrace{(V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}B^{rr}Y^{rr})}_{DVA\_INT1} + \underbrace{(V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}\sum_{t\neq s,r}^{G} B^{rt}Y^{tt})}_{DVA\_INTrexI1} \\ &+ \underbrace{(V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}B^{rr}\sum_{t\neq s,r}^{G} Y^{rt})}_{DVA\_INTrexF} + \underbrace{(V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}\sum_{t\neq s}^{G}\sum_{ru\neq s,t}^{G} B^{rt}Y^{tu})}_{DVA\_INTrexI2} \\ &+ (V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}B^{rr}Y^{rs}) + (V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}\sum_{t\neq s,r}^{G} B^{rt}Y^{ts}) \\ &+ (V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}B^{rs}Y^{ss}) + (V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}\sum_{t\neq s}^{G} B^{rs}Y^{st}) \\ &+ (V^{s}B^{ss} - V^{s}L^{ss})^{T}\#(\sum_{r\neq s}^{G} A^{sr}X^{r}) + (\sum_{r\neq s}^{G} V^{r}B^{rs})^{T}\#Y^{sr} + (\sum_{t\neq s,r}^{G} V^{t}B^{ts})^{T}\#Y^{sr} \\ &+ (\sum_{r\neq s}^{G} V^{r}B^{rs})^{T}\#(A^{sr}L^{rr}Y^{rr}) + (\sum_{t\neq s,r}^{G} V^{t}B^{ts})^{T}\#(A^{sr}L^{rr}Y^{rr}) \\ &+ \sum_{r\neq s}^{G}(V^{r}B^{rs})^{T}\#(A^{sr}L^{rr}E^{r*}) + \sum_{t\neq s,r}^{G}(V^{t}B^{ts})^{T}\#(A^{sr}L^{rr}E^{r*}) \end{aligned} . \quad (9)$$

When considering DVA, both exports of final goods (FIN) and exports of intermediates (INT) are taken into account. There are two patterns in the trade of intermediates: they can be exported to direct trade partners (DVA_INT1) or re-exported to third countries via a direct partner (DVA_INT2). Additionally, domestic value added in intermediate exports that are re-exported to third countries as intermediates can be used to produce domestic final goods (DVA_INTrexI1) or to produce exports (DVA_INTrexI2). They can also be re-exported as final goods (DVA_INTrexF).

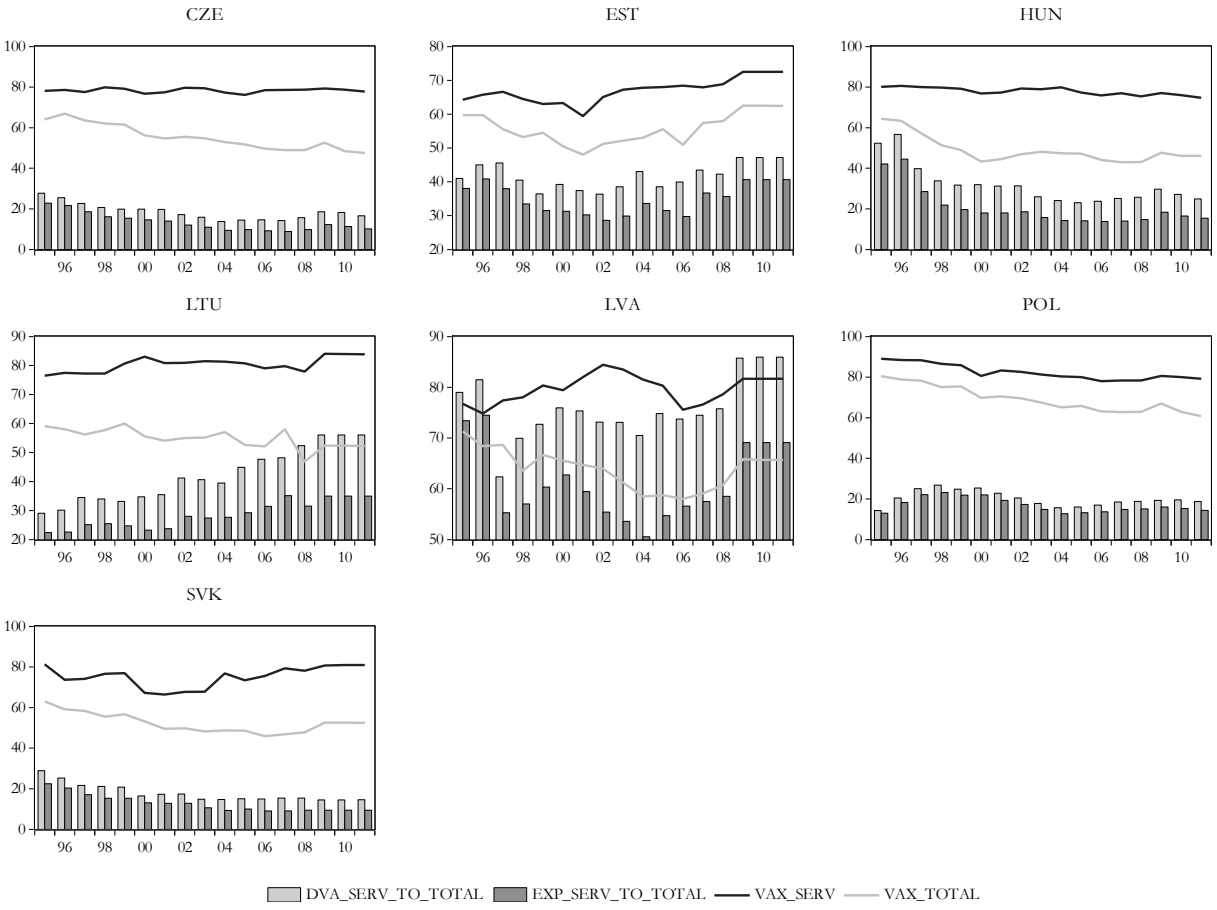
In our investigation, in addition to the levels of total gross exports and domestic value added we use revealed comparative advantage indices constructed on the basis of both gross exports and DVA. RCA indices use the classic formula proposed by Balassa (1965):

[9] For the details of the decomposition, we refer readers to the source article by Wang, Wei and Zhu (2013), Appendix J.

$$RCA_{i,s} = \frac{X_{i,s}}{\sum_s X_{i,s}} \Bigg/ \frac{\sum_i X_{i,s}}{\sum_i \sum_s X_{i,s}}, \tag{10}$$

and express the relative comparative advantage of a particular tradable service sub-sector *i* of country *s* in relation to the total exports of the country as a share of world exports.

Figure 3 VAX ratio for the service sector and the total economy, share of service DVA in total DVA, and share of service gross exports in total exports

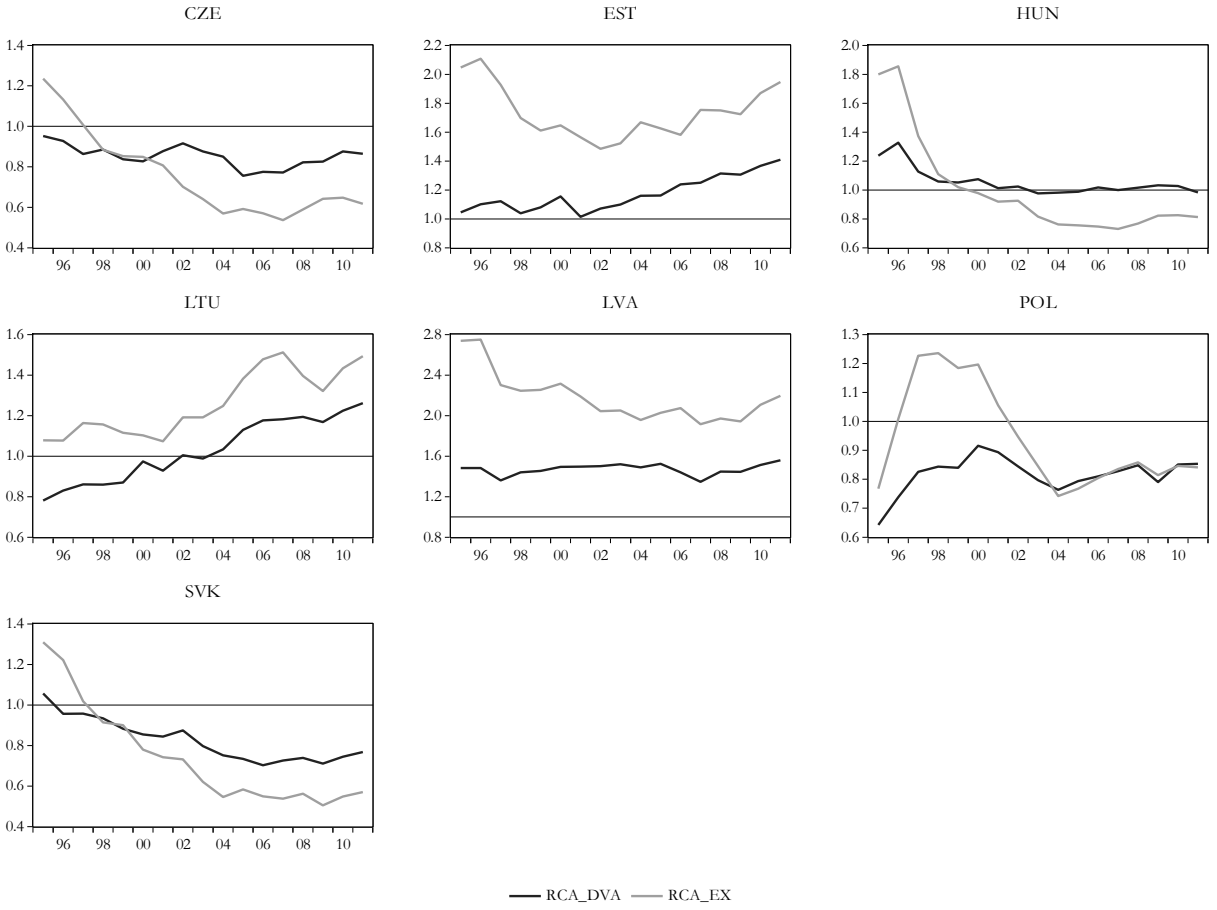


Source: own elaboration based on WIOD and Wang et al.'s (2013) decomposition.

For all the countries and for the whole period, the VAX ratio, which reflects the share of domestic value added in gross exports (Johnson and Noguera 2012) is higher for the service sector in comparison to the VAX ratio calculated for the total economy (Figure 3). The ratio fluctuates from 72% for Estonia to 83% for Lithuania at the end of the period. However, the highest level of the ratio is observed for 1995 for Poland (90%). The VAX ratio for the total economy declines for all the countries except Estonia, where a very slight growth is observed. The main reason for this downward trend is a drop in the DVA for manufacturing sectors due to growth in the importance of vertical specialization over the years analysed.

Regardless of which economy and period are analysed, the share of domestic value added by service activities in total domestic value added is higher than that of gross service exports in total gross exports. At the end of the period, the highest level of this share is observed for Latvia, with 85% of the total DVA generated in the economy represented by DVA in services. Moreover, the other Baltic countries achieve a higher share than the other CEE countries: 56% and 47% respectively for Lithuania and Estonia. At the end of 2011, DVA in services constituted less than 20% of the total DVA for the Czech Republic, Poland and Slovakia.

Figure 4 RCA indices based on domestic value added and gross exports



Source: own elaboration based on WIOD and Wang et al.'s (2013) decomposition.

Regarding RCA indices (Figure 4), especially those measured in domestic value added, the advantage revealed for the Baltic countries in the area of trade in services should be highlighted. Latvia and Estonia achieve advantages over the whole period, whereas for Lithuania a stable growth in its RCA is observed, with comparative advantages from 2004 for Lithuanian trade in services (the RCA index based on gross exports is greater than 1 for the whole period). The patterns of the RCAs for the Czech Republic, Hungary and Slovakia are similar. For Czech and Slovak trade in services after 1998 and for Hungarian trade after 1999, the RCA based on DVA is

higher than the RCA based on gross exports, but it does not provide comparative advantages for these countries.

The relationship between an export performance measure and its determinants for the seven CEE countries in seven tradable service sectors over the period 1995 – 2011 is expressed by the following equation:

$$EXP\_IND_{ijt} = \beta_0 + \beta_1 HS_{ijt} + \beta_2 MS_{ijt} + \beta_3 \ln LPRO_{ijt} + \beta_4 SMlink_{ijt} + \mu_i + \upsilon_j + \varepsilon_{ijt}. \quad (11)$$

In our model, as an export performance measure (*EXP_IND*) we use four indicators. First, the logarithm of exports of services in gross terms (*lnTEXP*) and flows expressed as the logarithm of domestic value added exports in services (*lnDVA*) are compared. The second approach compares the results obtained for revealed comparative advantage indices calculated on the basis of both gross exports (*RCA_TEXP*) and domestic value added (*RCA_DVA*).

In our approach we do not use the explanatory variables, which are often used in gravity model (such as GDP per capita, language, distance), because they are in our opinion not explain the nature of services trade. From the perspective of export growth, an increase in highly-skilled labour is an good indication of labour productivity growth. Thus, the structure of employment is taken into account. *HS* and *MS* denote the respective shares of hours worked by highly-skilled and medium-skilled workers in the total hours worked.

LnLPRO is the logarithm of labour productivity, which is obtained as the relation between value added based on 1995 prices corrected using the current exchange rate and the total hours worked by employed persons.

Due to the growing role of indirect exports of services through manufacturing sectors, servicification of manufacturing is taken into account in our model and is reflected in the service value added share of manufacturing exports (*SMlink*). Depending on the source of service production we distinguish between domestic (*domestic_SMlink*) and foreign (*forein_SMlink*) service contents of exported manufactured goods. To calculate these contents we use the OECD TiVA methodology (OECD 2015). The domestic value added by services and the foreign value added by services embodied in a country's manufacturing exports are calculated in the following way:

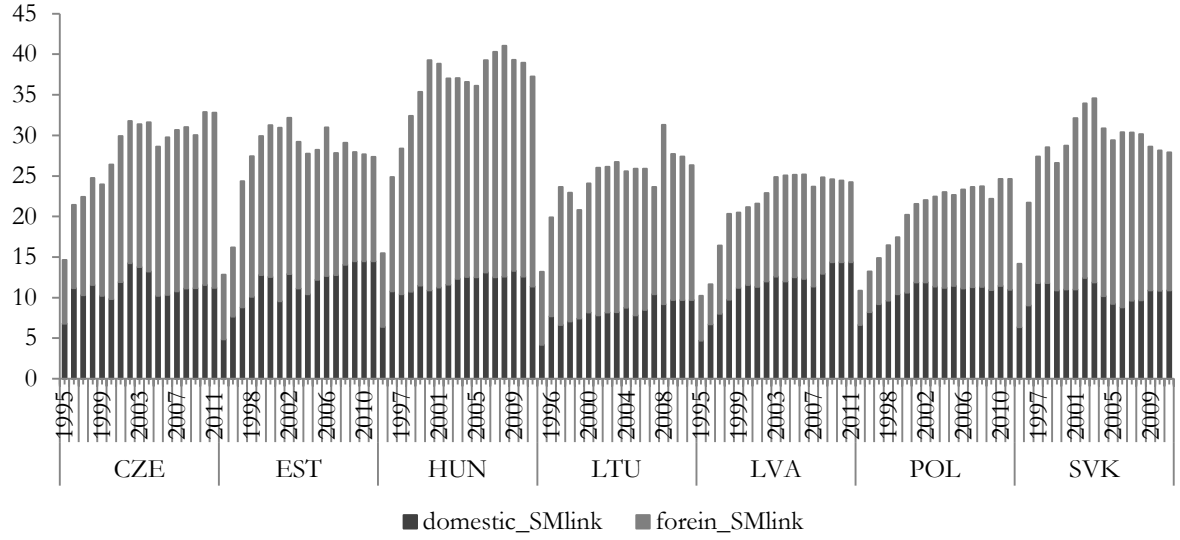
$$domestic\_SMlink = V_{domSERV}(I - A)^{-1} TEXP_{manuf}, \quad (12)$$

$$foreign\_SMlink = V_{forSERV}(I - A)^{-1} TEXP_{manuf}, \quad (13)$$

where V is an N×GN matrix with the share of the value added in total output for the particular tradable service sector of interest and zero otherwise, $(I\text{-}A)^{-1}$ is a GN×GN inverse global Leontief matrix and $TEXP_{manuf}$ is a GN×G matrix reflecting the gross exports of the manufacturing sector in the CEE countries and zero otherwise.

Given the high importance of business services we aim to assess whether this specific group of services comprising sector J and sector 71t74 and its linkages to the manufacturing sector influence export performance. To do this, interactive variables are calculated, *SMlink_J* and *SMlink_71t74,* as the product of *SMlink* and dummy variables constructed for sector J and sector 71t74. Analogous variables are computed for domestic and foreign linkages.

Figure 5 Percentages of domestic and foreign service content of total manufacturing exports



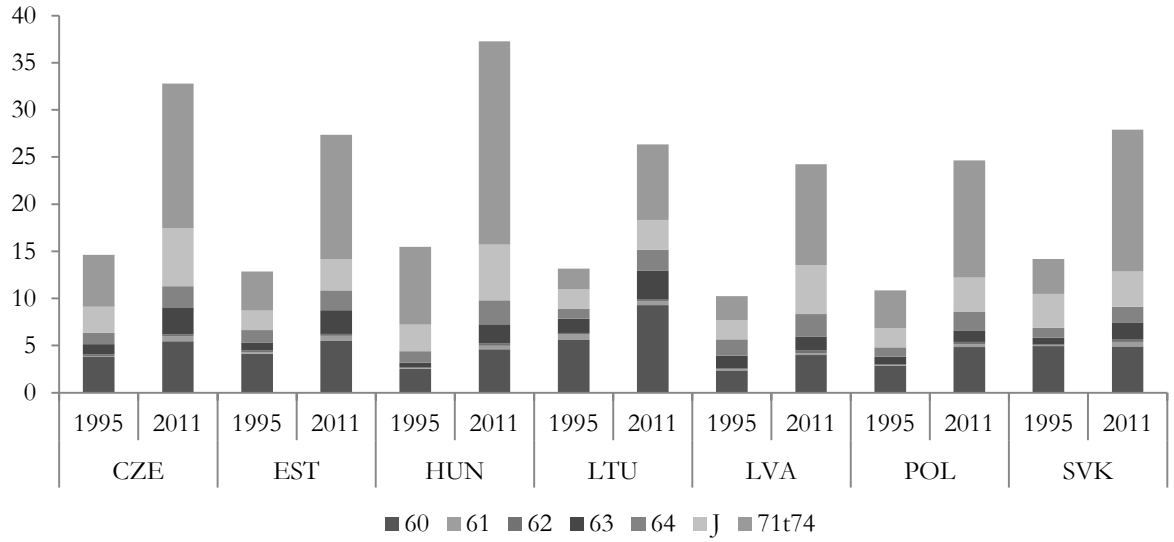
Source: own elaboration based on WIOD.

For 2011, the highest service value added content of manufacturing exports is observed for Hungary and the Czech Republic: 37% and 32% respectively (Figure 5). For the Baltic countries this share fluctuates from 24% to 27%. The results differ slightly in comparison to Figure 2, where the Baltic countries and Latvia especially play key roles in service contribution to manufacturing exports. The difference is a result of the number of service sectors taken into account: seven tradable sectors rather than divisions 45-95. However, when comparing the structure of the service value added contribution, the importance of foreign services is observed. For the service sectors analysed at the end of the period, domestic service content only exceeds foreign content for Latvia and Estonia.

Regarding the structure of the total service contribution to manufacturing exports by type of service sector, it is worth underlining the growing role of both business service sectors, financial intermediation and sector 71t74 (Figure 6). At the end of the period, the joint input of business service sectors to manufacturing exports is the highest for Hungary, with 27%, and then for the Czech Republic and Slovakia (21% and 19%). The significance of business service sectors in indirect exports through manufacturing is also visible in the growth in this contribution over

the years analysed. Between 1995 and 2011, Hungary enlarged its service sector share in exported manufactured goods by 16 percentage points, the Czech Republic by 13 points, and Estonia, Latvia, Poland and Slovakia by about 10% points. The lowest growth is observed for Lithuania with 7 percentage points of growth, which is relatively high in comparison to the growth in the other sectors.

Figure 6 Structure of the total service content in the manufacturing sector by service sector



Source: own elaboration based on WIOD.

The second sector which contributes strongly to manufacturing is inland transport (sector 60). In this area, the leading countries are Lithuania with a contribution of 9% and then Estonia and the Czech Republic (5.5%).

Estimation results

The estimation procedure consists of two stages. First, as dependent variables in model (11) we use exports measured in gross terms and in value added terms. Next, as the explained variable in the same model we use RCA indices determined using both gross exports and value added in exports.

The results for exports measured in the two ways are reported in Table 1. Comparing all four estimations, only slight discrepancies between coefficients for particular variables are observed. Regardless of the regression estimated, we obtain stable and statistically significant coefficients for highly-skilled and medium-skilled workers and also for labour productivity and domestic linkages between service sectors and manufacturing.

Table 1 The impact of selected determinants on gross exports and domestic value added

	Gross exports		Domestic value added	
	1	2	3	4
HS	0.052**	0.048**	0.048**	0.044**
	[0.021]	[0.021]	[0.021]	[0.021]
MS	0.053**	0.048**	0.051**	0.046**
	[0.021]	[0.021]	[0.021]	[0.022]
lnL_PRO	0.642***	0.640***	0.671***	0.669***
	[0.076]	[0.077]	[0.076]	[0.078]
total_SMlink	-0.028		-0.050	
	[0.037]		[0.037]	
total_Smlink_J	-0.010		0.015	
	[0.076]		[0.075]	
total_Smlink_71t74	0.099**		0.121***	
	[0.040]		[0.039]	
domestic_SMlink		-0.193***		-0.194***
		[0.056]		[0.054]
domestic_Smlink_J		0.200*		0.217**
		[0.110]		[0.108]
domestic_Smlink_71t74		0.307***		0.314***
		[0.068]		[0.066]
forein_ SMlink		0.086		0.050
		[0.053]		[0.052]
forein_ Smlink_J		-0.153		-0.125
		[0.110]		[0.109]
forein_ Smlink_71t74		-0.037		-0.004
		[0.055]		[0.055]
R2	0.7384	0.7427	0.7517	0.7551
N	733	733	733	733

Note: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors in parentheses. The panel is specified using country-industry pairs. In all the specifications, time-invariant fixed effects both for countries and individual service sectors are included.
Source: own calculations.

Considering skill composition, contrary to the findings of, e.g., Landesmann et al. (2015) for 40 countries and analogous service sectors, the influence of highly- and medium-skilled labour on export performance is quite similar. The strength of the impact does not depend either on the specification of the model or on the export measure. Each growth in hours worked for both groups of workers generates an increase in the export indicator of around 5%.

As a main determinant of export activity in new trade theory, labour productivity affects export indicators in a positive and significant way, which is in line with our expectations.

Given the aim of this paper, it is interesting to look closer at the linkages between service sectors, in particular business service sectors, and manufacturing exports. Analysing the coefficients from regressions (1) and (3), the only significant influence is observed in case of linkages with sector 71t74. This sector's contribution to manufacturing trade is significant (Figure 6) and this can be a reason for the impact revealed of this sector on service trade.

More details of the relationship can be shown by dividing the total service content of manufacturing exports according to the location of the production of services. The domestic added value of all the tradable service sector content of domestic manufacturing exports does not support service export performance, but when we take business service sectors into consideration, a strong positive and statistically significant influence is observed. This means that this dynamically growing sector which strongly contributes to manufacturing trade, through this channel also supports trade in services. Domestically produced services matter in shaping export flows, but services which are produced abroad as intermediates and are exported by manufacturing do not influence exports of services.

Our second step is devoted to an evaluation of the impact of selected determinants on RCA indices, again measured in two ways – in gross terms and value added terms (Table 2). As previously, an increase of hours worked by both, highly-skilled and medium-skilled employees leads to the growth of exports indicator. Both of the groups determine strongly the growth of comparative advantages in CEE countries, however the influence of human factor is almost twice as strong, when we take RCA value-added-based into account.

Considering the coefficients connected with service content to manufacturing exports, crucial discrepancies between the influence of the determinant on RCA measured in two way are also observed. Revealed comparative advantage index constructed on the base of value added reacts much more stronger on changes of service-manufacturing linkages, especially in case of totally and domestically produced services. Taking into consideration total service linkages, statistically significant influence is revealed in value added model only. Similarly to our first step total linkages affect RCA in a negative way, but both of the business service sectors (J and 71t74), regardless of the source of its production, enlarge RCAs. The same situation is observed in the case of domestic services contributing manufacturing sector. Only domestic business services are able to support the growth of comparative advantages.

The only difference in comparison to the results obtained in first step is for labour productivity which has a negative and significant impact on RCA value-added-based. The negative impact of growing labour productivity on RCA can be explained by a labour migration

and earlier retirement of highly-skilled workers which results the growth of wages faster than in EU.

Table 2 The impact of selected determinants on RCA based on gross exports and on domestic value added

	RCA_TEXP		RCA_DVA	
	5	6	7	8
HS	0.080***	0.071***	0.046***	0.034***
	[0.017]	[0.018]	[0.009]	[0.010]
MS	0.065***	0.058***	0.043***	0.033***
	[0.017]	[0.018]	[0.009]	[0.010]
lnLPRO	-0.059	-0.058	-0.074***	-0.075***
	[0.041]	[0.040]	[0.028]	[0.026]
total_SMlink	-0.043		-0.246***	
	[0.074]		[0.059]	
total_Smlink_J	0.136*		0.227***	
	[0.082]		[0.060]	
total_Smlink_71t74	0.068		0.226***	
	[0.074]		[0.058]	
domestic_SMlink		-0.445***		-0.771***
		[0.125]		[0.134]
domestic_Smlink_J		0.356***		0.566***
		[0.135]		[0.140]
domestic_Smlink_71t74		0.371***		0.674***
		[0.129]		[0.135]
forein_ SMlink		0.240**		0.122*
		[0.122]		[0.074]
forein_ Smlink_J		-0.002		0.011
		[0.133]		[0.080]
forein_ Smlink_71t74		-0.157		-0.095
		[0.123]		[0.075]
R2	0.4840	0.4694	0.5438	0.5413
N	733	733	733	733

Note: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors in parentheses. The panel is specified using country-industry pairs. In all the specifications time-invariant fixed effects both for countries and individual service sectors are included.
Source: own calculations.

When we compare Figure 3 and Figure 4, a kind of "Baltic countries model" and "Visegrad countries model" can be observed. Due to this reason we decided additionally to evaluate the differences between the impact of selected determinants on exports and value added exports in both groups of the countries. The results are presented in Table 3.

Table 3 The impact of selected determinants on gross exports and on domestic value added for Baltic and Visegrad countries

	Gross exports				Domestic value added			
	Baltic Countries		Visegrad Countries		Baltic Countries		Visegrad Countries	
	9	10	11	12	13	14	15	16
HS	0.057***	0.057***	0.083***	0.067**	0.056***	0.056***	0.077***	0.063**
	[0.014]	[0.013]	[0.026]	[0.026]	[0.013]	[0.013]	[0.027]	[0.027]
MS	0.040***	0.041***	0.058**	0.043*	0.040***	0.040***	0.059***	0.045*
	[0.014]	[0.014]	[0.023]	[0.023]	[0.014]	[0.013]	[0.023]	[0.024]
lnLPRO	0.997***	1.001***	0.277**	0.256**	1.017***	1.021***	0.321***	0.303***
	[0.037]	[0.037]	[0.111]	[0.111]	[0.036]	[0.035]	[0.116]	[0.116]
total_SMlink	-0.093**		-0.013		-0.094**		-0.060	
	[0.039]		[0.051]		[0.037]		[0.050]	
total_Smlink_J	0.028		-0.166		0.031		-0.115	
	[0.069]		[0.119]		[0.068]		[0.117]	
total_Smlink_71t74	0.079*		0.098*		0.082*		0.145***	
	[0.045]		[0.056]		[0.043]		[0.054]	
domestic_SMlink		-0.294***		-0.372***		-0.274***		-0.381***
		[0.054]		[0.094]		[0.050]		[0.091]
domestic_Smlink_J		0.199*		0.172		0.181		0.196
		[0.116]		[0.177]		[0.112]		[0.173]
domestic_Smlink_71t74		0.310***		0.465***		0.302***		0.473***
		[0.062]		[0.120]		[0.059]		[0.118]
forein_ SMlink		0.028		0.311***		0.015		0.231***
		[0.040]		[0.093]		[0.039]		[0.088]
forein_ Smlink_J		-0.068		-0.454***		-0.051		-0.380**
		[0.117]		[0.161]		[0.118]		[0.158]
forein_ Smlink_71t74		-0.074		-0.224**		-0.067		-0.143
		[0.051]		[0.096]		[0.051]		[0.091]
R2	0.7069	0.7426	0.7902	0.7999	0.7174	0.7501	0.8010	0.8091
N	315	315	418	418	315	315	418	418

Note: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors in parentheses. The panel is specified using country-industry pairs. In all the specifications time-invariant fixed effects both for countries and individual service sectors are included.
Source: own calculations.

The most noticeable discrepancy is observed for labour productivity. This factor influences both gross exports and domestic value added much more stronger in Baltic countries. Each 1% growth in *LPro* results in about 1% growth of exports, while for Visegrad countries this brings the increase in exports of around 0,25 – 0,32 %. Regarding labour force composition, highly-skilled workers support the growth of exports and value added exports stronger than medium-skilled workers, especially in Visegrad group. In comparison to previous models, the positive and significant influence of total foreign service linkages on service exports is revealed,

but this takes place in Visegrad countries only, however foreign business service sectors and their contribution to manufacturing exports are associated with decreasing service exports performance. Similarly to results in Table 1, domestic services comprising sector 71t74 which contribute manufacturing exports, generate the growth of services trade.

Conclusions

In the modern economy, services are no longer non-transportable, non-tradable or non-scalable. They should instead be treated as a niche, where each economy can develop its comparative advantages beyond manufacturing and find a new path along which to increase trade. As our results show, service sectors have made a significant contribution to CEE exports, especially if we measure it in value added terms. Not only does the direct contribution of services to exports remain high, but so does their indirect contribution that is embedded in manufacturing exports. The linkages between domestic services (especially financial intermediation services and business services) and manufacturing are significant in explaining CEE export growth. Our results also indicate that labour productivity and a high quality of human capital are crucial determinants of export growth in service sectors.

The results of this study should be regarded as preliminary and requiring verification. We hope that the results of the estimations will contribute to discussion of the instruments which can help accelerate service-led export growth in CEE economies. We consider this path to be the largest opportunity for CEE economies to deepen, generating more added value participation in global GVCs and also shortening the distance from the most developed economies. Therefore, policymakers should be open to a change in perspective when crafting trade policies by taking into account the development of service sectors.

The main policy recommendations that emerge from our analysis are aimed at opening up the service sector to foreign participation. More opened domestic services markets will foster innovation and productivity. Further regulatory reform of services markets will create opportunities for firms to develop new services, improve the quality of existing services and meet emerging global demands. In opening services markets especially desirable are the reduction of public ownership in competitive industries such as air transport and the reduction of entrepreneurship barriers.

We also recommend building up skills to move into more sophisticated services to generate greater added value. All partnerships and co-financing by firms, workers and governments to foster life-long learning is essential. Also the incentives for private financing of

life-long learning should be improved as well as equitable access to formal and on-the-job learning.

Finally, we suggest to adapt innovation policies to the growing importance of services innovation. Policy makers should consider how existing public R&D can better address the needs of the services sector and how to improve the links between services sector firms and manufacturing.

Further analyses are needed. Any analysis which helps understanding of how various manufacturing GVCs use and supply services is very desirable. From the methodological point of view, further estimation of the models for a longer time series would be very appropriate. When the data become available in different databases, new explanatory variables such as ICT intensity or services restrictiveness can be taken into account in our model. Additionally, it is evident that there is a large and diverse range of business- related service that interface with manufacturing in different ways e.g. by providing varying technological, operational, distributive and financial capabilities. We can disaggregate the business services sector into more specific group e.g. for knowledge intensive business services and other business services and analyze more deeply the business services linkages to manufacturing sector.

Limitations related to data on services are very well understood. They are related to differences in reporting, reliability, definitions and collection methods among countries. Although many international efforts have been made to improve the comparability and coverage of service trade statistics, one should use some caution in interpreting the results.

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